

**URBANDALE COMMUNITY SCHOOL DISTRICT
CURRICULUM FRAMEWORK OUTLINE**

SUBJECT: Science
COURSE TITLE: College Physics
CREDITS: 2 Credits/5DMACC
PREREQUISITES: B or better in Chemistry and Trigonometry (DMACC recommends that students have an ACT of 21 and a GPA of 3.5)

COURSE DESCRIPTION:

Physics is an advanced two-semester college credit science course that is taught by experimentation in the lab. The first semester consists of the study of force, rectilinear motion, curvilinear motion, work, power and energy. The second semester consists of the study of wave motion, sound, light, optics, interference and diffraction. This course is a very intense course and is recommended only for the serious science and math students. Engineering projects consisting of a mousetrap car and a catapult car will be constructed the first and second quarters. The second semester project will be to engineer a miniature roller coaster to enter into a competition at Iowa State University.

CONTENT STANDARDS:

In order that our students may achieve the maximum benefit from their talents and abilities, the students of Urbandale Community School District's Physics should be able to . . .

Content Standard I. Understand and apply the concepts of life science.

Not addressed in this course

Content Standard II. Understand and apply the concepts of earth and space science.

Not addressed in this course

Content Standard III. Understand and apply the concepts of physical science.

Benchmarks: Investigates the methodology, mathematical language and measurement skills of physics
Mathematically describes motion of linearly moving objects.
Describes the interaction of forces.
Mathematically describes motion of projectile and rotating objects.
Explains the concept of conservation of momentum and energy.
Investigates wave mechanics.
Explains the concept of sound.
Investigates the concept of electromagnetic radiation.
Distinguishes between reflective and refractive optics.

Content Standard IV. Understand and apply the concepts of health science.

Benchmarks: *Not addressed in this course*

Content Standard V. Understand and apply scientific method.

Benchmarks: Applies creative scientific thought processes.



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COURSE TITLE: Physics

GRADE LEVEL: 2 Credits

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CONTENT STANDARDS AND COURSE BENCHMARKS WITH INDICATORS FOR PHYSICS

Standard I. Understand and apply the concepts of life science.

Not addressed in this course

Standard II. Understand and apply the concepts of earth and space science.

Not addressed in this course

Standard III: Understand and apply the concepts of physical science. The students in Physics should be able to . . .

Benchmark: Investigate the methodology, mathematical language and measurement skills of physics.

Indicators: Apply scientific methodology to a given problem. (A)
Observe and measure various properties of matter. (D)
Convert back and forth between given and desired units. (A)
Calculate the percent error of a measurement. (A)
Apply trigonometric functions to a variety of problems. (A)
Determine measurements of length, mass and time. (A)
Determine relationships by graphical analysis. (D)

Assessments: District Assessment
Online problem set
Interactive Ch 1-2 e-Lab
Written exam
Group lab practical : CSI 1
Semester exam

Benchmark: Mathematically describe motion of linearly moving objects.

Indicators: Calculate and measures displacement, speed, velocity and acceleration. (A)
Apply the uniform acceleration equations to a variety of motion problems. (A)
State and apply Newton's three laws. (A)
Calculate gravity at various altitudes. (A)



Use vector addition in plane and boat problems. (D)
Draw and interpret D-T and V-T graphs. (D)
Determine the effect of density on terminal velocity. (D)
Apply the concepts of motion to an engineering process. (A)

Assessments: District Assessment
Online problem set
Interactive Ch 3 e-Lab
Written exam
Group lab practical : CSI 1
Semester exam

Benchmark: Describe the interaction of forces.

Indicators: Calculate the resultant of several component vectors. (A)
Determine the equilibrant that will achieve equilibrium. (A)
Resolve a vector into its component parts. (A)
Apply mathematical concepts to inclined plane problems. (A)
Calculate the friction force on an object. (A)
Calculate clockwise and counterclockwise torques. (A)
Determine where a force should be applied to achieve rotational equilibrium. (D)

Assessments: District Assessment
Online problem set
Interactive Ch 4 e-Lab
Written exam
Group lab practical : CSI 2
Semester exam

Benchmark: Mathematically describe motion of projectile and rotating objects.

Indicators: Calculate the angle needed to achieve a given range. (D)
Calculate centripetal force and centripetal acceleration. (A)
Determine the critical velocity of a roller coaster car on a loop. (A)
Calculate rotational kinematic problems. (D)
Determine the period of a pendulum by knowing its length. (A)
Use a pendulum to determine gravity on a planet. (A)
Recite the rotational inertia equations for a ring, disk and sphere. (A)

Assessments: District Assessment
Online problem set
Interactive Ch 5 e-Lab
Written exam
Group lab practical : CSI 2
Semester exam

Benchmark: Explain the concept of conservation of momentum and energy.



Indicators: Derive the equations for work and energy and thus prove their relationship. (A)
Discuss the six simple machines and calculate their MA and their IMA. (D)
Determine the efficiency of a machine. (A)
Determine the horsepower of a machine. (D)
Prove the relationship between joules and calories. (D)
Describe the conservation of linear and rotational energy. (A)
Determine the efficiency of a motor. (D)

Assessments: District Assessment
Online problem set
CSI: Physics Pirates
Written exam
Group lab practical : CSI 2
Semester exam

Benchmark: Investigate wave mechanics.

Indicators: Describe energy transfer by waves. (A)
Define and differentiate among rectilinear propagation, reflection, refraction, diffraction and interference of waves. (A)
Apply the superposition principle of wave trains. (A)
Demonstrate the use of an oscilloscope. (D)
Interpret Lissajou figures. (D)
Describe wave properties by using a ripple tank. (D)
Describe the different ways that light becomes polarized. (D)
Describe polarized light and strain patterns. (D)
Describe thin film interference. (D)
Interpret the elements present in a spectrograph. (D)
Measure the width of a human hair using a laser. (A)

Assessments: District Assessment
Online problem set
Interactive Ch 10 e-Lab
Written exam
Group lab practical : CSI 3

Benchmark: Explain the concept of sound.

Indicators: Describe the frequency range of sound. (A)
Define and describe the properties of sound waves. (A)
Describe the measurement of sound levels and the Doppler Effect. (D)
Describe the nature of musical sounds. (D)
Apply the laws of vibrating strings. (A)
Describe forced vibrations and beats. (A)
Calculate the speed of sound in air by use of closed and open tubes. (A)
Calculate pitch drop by use of the combined Doppler equation. (D)



Calculate the speed of sound in various metallic elements. (D)

Assessments: District Assessment
Online problem set
Interactive Ch 11 e-Lab
Written exam
Group lab practical : CSI 3

Benchmark: Investigate the concept of electromagnetic radiation.

Indicators: Describe the properties of light. (A)
Understand the historical development of the wave theory of light. (D)
Describe the electromagnetic spectrum. (A)
Describe the photoelectric effect and its importance in the development of quantum theory. (D)
Describe the basic principle behind the laser. (D)
Define and describe photometry. (D)

Assessments: District Assessment
Online problem set
Interactive Ch 12 e-Lab
Written exam
Group lab practical : CSI 3

Benchmark: Distinguish between reflective and refractive optics.

Indicators: Describe regular and diffused reflection. (D)
Describe the law of reflection. (A)
Analyze the images formed by plane mirrors. (D)
Define the terminology of curved mirrors. (A)
Describe the location of image points formed by concave and convex mirrors. (A)
Apply the mirror and lens equation. (A)
Describe the relationship between optical refraction and the wave character of light. (D)
Show the effect of refraction on the speed of light. (A)
Describe the control of light beams with lenses. (A)
Analyze the formation of images by ray diagrams. (A)
Explain the magnification of images. (D)
Describe the dispersion of light by prisms. (D)
Describe the addition and subtraction of colors. (A)

Assessments: District Assessment
Online problem set
Interactive Ch 13-14 e-Lab
Written exam
Group lab practical : CSI 4



Standard IV. Understand and apply the concepts of health science.

Not addressed in this course

Standard V: Understand and apply scientific method. The students in Physics should be able to . . .

Benchmark: Apply creative scientific thought processes.

- Indicators:
- Ask questions and understands failure is necessary. (A)
 - Strategize independently and as a research team. (A)
 - Construct functioning projects while remaining within confines of engineering restrictions. (A)
 - Apply physics concepts to real world projects. (A)

- Assessments:
- District Assessment
 - Mousetrap car competition
 - Catapult car competition
 - ISU roller coaster competition
 - Drake University physics Olympics
 - CSI 1-4 lab practicals

No student enrolled in the Urbandale Community School District shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination in the District's programs on the basis of race, color, creed, sex, religion, marital status, ethnic background, national origin, disability, sexual orientation, gender identity, or socioeconomic background. The policy of the District shall be to provide educational programs and opportunities for students as needed on the basis of individual interests, values, abilities and potential.

